APPENDIX D

PRELIMINARY SUBSURFACE EXPLORATION AND GEOTECHNICAL EVALUATION

PRELIMINARY SUBSURFACE EXPLORATION & GEOTECHNICAL EVALUATION

MENOMONEE CASINO-HOTEL

KENOSHA, WISCONSIN

April 1, 2005

Prepared for:

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Menomonee Kenosha Gaming Authority

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PROJECT OVERVIEW and REPORT PURPOSE

Kenesah Gaming Development, LLC. ("KGD") is planning to redevelop the existing Dairyland Greyhound Park facility and adjacent grounds in Kenosha, Wisconsin. The redevelopment will involve several structures constructed in two phases and one future phase. The largest structure will be a gaming, associated amenity and support structure. This structure will have an approximate floor area of 885,900 square feet in Phase 1, which will expand to 998,600 square feet in Phase 2. A hotel having an approximate floor area of 428,100 square feet is planned to be connected to the north side of the main structure as part of Phase 2. Another hotel, with an approximate floor area of 390,000 square feet and a 50,000 square foot indoor water park is being considered in the western portion of the site as a future phase. Warehouse facilities and a RV park will be developed on the southeast portion of the site. A parking structure accommodating 5,000 cars, a 2,000 car underground valet parking structure and a 1,500 car employee surface parking lot will be constructed as part of Phase 1. The parking structure will be expanded to 6,500 cars as part of Phase 2. Additional paved service lots and access roads will also be constructed to accommodate the proposed development.

Although structural information is not yet available for any of the proposed structures, we understand the proximity to the nearby municipal airport will limit the height of all facilities to 58 feet above existing grades. With the exception of the parking structure, it is not known if any of the buildings will have basements.

The project area is currently occupied by a combination of an asphaltic-concrete-surfaced parking lots and drives, and green space. The eastern and central portions of the site are relatively level, with elevations ranging from 709[1] to 715. The topography on the western portion of the site is more variable, with elevations varying from 693 to 740.

This geotechnical engineering report is to serve as a preliminary assessment of the soil conditions present at select locations spaced over the project site. The number of borings, and their respective depths were chosen to provide this general overview, with the understanding that additional borings will be performed in planned building footprints once locations, elevations, and preliminary structural loadings are known.

[1] Unless noted otherwise, all elevations in this report are positive, in units of feet, and are with respect to project datum.

EXPLORATION PROGRAM

Field Exploration Program

The exploration program consisted of drilling and sampling 6 borings spaced over the project site. Boring locations were originally selected by Graef, Anhalt, Schloemer and Associates, Inc. ("GASAI"). Some boring locations were altered slightly due to drill rig accessibility by Wagner Komurka Geotechnical Group, Inc. ("WKG^2"). The approximate as-drilled locations of these borings are shown on the Soil Boring Location Diagram in the Appendix. The ground surface elevations at as-drilled boring locations were estimated based on a topographic map provided by GASAI.

WKG^2 notified Digger's Hotline of the intent to perform soil borings so that members' underground utilities were marked prior to the start of drilling. The borings were drilled by a subcontract driller, Badger State Drilling Company, Inc. ("BSD") of Stoughton, Wisconsin on May 11-12, 2004 using a truck-mounted CME 55 drill rig. All borings were extended to a depth of 25 feet. The methods used to advance the borings are noted on the boring logs. The drillers logged conditions encountered in the borings.

Soil samples were typically obtained at 2.5-foot intervals to a depth of 10 feet, and at 5 foot intervals thereafter to the boring termination depth. Samples were obtained in general accordance with ASTM Specification D-1586 "Standard Method for Penetration and Split-Barrel Sampling of Soils." A description of this sampling procedure is included in the Appendix.

As each soil sample was brought to the ground surface, the material was preliminarily classified by the driller. Representative portions of the split-barrel samples were then sealed in glass jars. Samples were delivered to WKG^2.

During exploration, the driller maintained a field log for each boring which described the method(s) of borehole advancement, sample depths, lengths of sample recoveries, and observations regarding soil and groundwater conditions. These field logs were later used by the geotechnical engineer as an aid in preparing the final boring logs.

All borings were abandoned in accordance with Wisconsin Department of Natural Resources ("WDNR") requirements immediately after completion. Abandonment forms are included in the Appendix.

Laboratory Testing Program

The laboratory testing program consisted of performing calibrated penetrometer strength and water content tests on selected cohesive soil samples. The calibrated penetrometer strength test is a method of estimating a cohesive soil's unconfined compressive strength by measuring the soil's resistance to penetration of a small, spring-calibrated plunger. The water content test (ASTM D-2216) is used as a qualitative indicator of soil compressibility.

The laboratory test results are presented on the boring logs by the symbols defined in the legend on the logs. It should be noted that the lines on the boring logs connecting like test results are included as a visual aid to interpret the logs, and are not intended to represent intermediate values between elevations of test samples.

Each soil sample was visually examined by a geotechnical engineer, and classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System ("USCS"). A chart describing this system of classification is included in the Appendix. The two-letter designator following each soil description on the boring logs is the group symbol using this method of classification.

Similar soils were grouped into the major zones noted on the boring logs. In some cases, strata contact lines have been estimated. Where stratum changes occur between sampled depths, and the driller's field log does not indicate a stratum change depth based on drilling action, the stratum change depth is indicated as the midpoint between recovered sample depths. In-situ, the transition between soil types may not occur at the midpoint between sampled depths, and may be gradual in both the horizontal and vertical directions. For these reasons, for this report narrative, referenced soil-strata depths and thicknesses should be considered approximate. Additional information regarding preparation of the final boring logs from laboratory tests is provided on the sheet titled "Laboratory Procedures" included in the Appendix.

All samples recovered from the borings will be retained by WKG^2 for a period of 60 days after the date of this report, after which they will be discarded unless other instructions as to their disposition are received.

EXPLORATION RESULTS

The following narrative is a generalization of the subsurface conditions encountered by the borings with depths approximate, and referenced to existing ground surface. For a more-detailed description of the subsurface conditions encountered at each boring location, please refer to the boring logs.

Subsurface Conditions

Topsoil

Topsoil was encountered at the surface of each boring except B-4. The topsoil generally was on the order of 12 inches thick, with the exception of Boring B-5, where a 22-inch-thick topsoil layer was encountered.

Pavement

Pavement consisting of one inch of asphaltic concrete overlying 6 inches of granular base course was encountered at the surface of Boring B-4.

Fill and Possible Fill Soils

Fill soils consisting of both medium dense fine to coarse sand and of hard silty clay were encountered to a depth of 5.3 feet in Boring B-5. Possible fill soils consisting of very stiff to hard silty clay were encountered in the upper 4.8 feet of Boring B-2.

Native Soils

The native soils encountered at the site consisted predominantly of silty clay. A few silt and/or fine sand seams were also encountered. The consistency of the silty clay ranged from stiff to hard, with decreasing consistencies with depth. Water contents ranged from 12 to 22 percent.

Groundwater Conditions

Groundwater was encountered at depths ranging from 1.7 feet to a dry borehole (i.e., no water encountered to a depth of 25 feet). Due to the predominantly low-permeability soils at the site, it is likely that these observations reflect the existence of water-bearing granular seams, which may possibly be perched, and not necessarily indicative of the groundwater table.

Another estimate of groundwater levels in fine-grained soils can be made by observing changes in soil color. Soil color can be used as an aid to estimate the lowest past groundwater elevation. Typically, fine-grained soils of the type encountered in the borings are brown when they occur above, and gray when they occur below, the lowest past groundwater table elevation. This change reflects oxidation of the soil above the groundwater table. In our exploration, this brown-to-gray transition was encountered at depths varying from 5.5 to 17 feet, corresponding to elevations between 698.5 and 712.5, with most transitions between Elevation 700 and 707. It is our opinion that the groundwater table is likely between Elevation 700 and 707.

Please note that groundwater elevations are affected by changes in precipitation, evaporation, evapotranspiration, surface runoff, the presence of perched water, etc. Variations in the groundwater elevation should be expected.

ANALYSIS AND RECOMMENDATIONS

The following discussion is presented as a preliminary assessment of subsurface conditions for the proposed construction. The following recommendations should be reviewed by WKG^2 for applicability when building and structural details are known.

Foundations

Based on the conditions encountered in the soil borings, it is our opinion that proposed structures can likely be founded on shallow spread foundations bearing at typical depths. We estimate that maximum net allowable soil bearing stresses in the range of 4,000 to 8,000 pounds per square foot ("psf") can be used for design, depending on the locations and elevations at which the foundations bear. The maximum net allowable soil bearing stress refers to the stress transmitted to the soil in excess of the minimum final adjacent overburden stress.

Higher net allowable bearing stresses on native soils can likely be justified through in-situ testing using a device known as a pressuremeter. Based on experience with soils similar to those encountered in this investigation, we believe that net allowable bearing stresses on the order of 2 times that justified through routine sampling and testing techniques can be realized through pressuremeter testing. These significantly higher net allowable bearing stresses can result in smaller (and therefore less costly) foundations. Pressuremeter testing, however, will likely not be useful in significantly increasing net allowable bearing stresses in foundations bearing on either existing or new fill soils. Once approximate building loads and foundation bearing elevations are known, WKG^2 can evaluate the economic attractiveness of pressuremeter testing.

In order to limit frost penetration below foundations, we recommend that exterior and perimeter foundations bear at a minimum depth of 4 feet below the lowest final adjacent ground surface. For stability considerations during construction, isolated column and continuous wall foundations should have minimum widths of 30 and 18 inches, respectively.

We estimate that total settlements of properly sized foundations bearing on the native silty clay soils will range from negligible to approximately ¾ inch. Differential settlements between similarly sized and loaded footings will be on the order of half the estimated total settlement. Differential settlements between the existing building and any new contiguous construction will approach the estimated total settlement.

Additional recommendations, including construction considerations and subgrade observation, can be made once building locations, elevations, and loads have been established.

Site Preparation

The site will need to be cleared of existing pavements, ancillary structures, and grubbed prior to earthwork activities. The entire subgrade should be proofrolled prior to construction of foundations, or placement of fill. We anticipate that the inorganic silty clay soils encountered at the site likely will be suitable for use as structural fill. Please note that fine-grained soils (such as silty clay) are sensitive to the water content at which they are placed. Therefore, it may be necessary to moisture condition the soils (by either disking and drying or wetting) to facilitate compaction. Additional earthwork recommendations are provided in the Appendix.

Floor Slabs On Grade

We anticipate that floor slabs can bear on the native soils that were encountered, or on new properly placed and compacted structural fill and designed as conventional slabs on grade.

Basements/Below-Grade Parking Structures

We anticipate that it will be feasible to construct basements and below-grade parking structures. Due to the fine-grained soils encountered, which have relatively low permeabilities, it is our opinion that the groundwater table can be locally depressed using typical sump and pump systems. Based on the soils encountered in the borings, there does not appear to be a significant hydraulic connection between the pond on the northern portion of the site and the soils in the area slated for the parking structure/casino structure.

Seismic Design Recommendations

We consider the soils encountered at this site Site Class C soils as defined in the International Building Code Section 1615.1.

Discussion regarding historical seismic activity for southeast Wisconsin is summarized in a memorandum from GASAI, contained in the Appendix.

Shrink/Swell Potential

The soils at this site have relatively low plasticity and are generally not considered susceptible to shrink/swell due to moisture changes.

Construction Considerations

We anticipate that groundwater inflow to excavations made into the silty clay soils encountered at the site can be handled by pumping from sump pits. Subgrade exposure time to water should be minimized. Any soils that become disturbed from contact with groundwater should be removed prior to placing fill or concrete.

We recommend that all earthwork operations and foundation subgrades be observed and tested by an experienced geotechnical engineer or a qualified soils technician to determine if the soil and groundwater conditions encountered are consistent with those anticipated in this report. Foundation subgrades should be tested for adequate bearing conditions. Subgrades for slabs and new structural fills should be tested for conformance to specifications.

The Owner and Contractor should make themselves aware of, and become familiar with, applicable local, state, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards. Construction-site safety generally is the responsibility of the Contractor, who should also solely be responsible for the means, methods, and sequencing of construction operations. We are providing this information solely as a service to our client. Under no circumstances should the information provided below be interpreted to mean that WKG^2 is assuming responsibility for construction-site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

The Contractor should be aware that slope height, slope inclination, or excavation depths should in no case exceed those specified in local, state, or federal safety regulations, (e.g. OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926), or successor regulations. Such regulations are strictly enforced, and if they are not followed, the Owner, Contractor, and/or earthwork Subcontractor(s) could be liable for substantial penalties.

It is our opinion that all soils at the site will be considered Type B soils. OSHA requires side slopes of 1 horizontal to 1 vertical, or flatter for excavations through Type B soils. Excavations extending deeper than 4 feet should have side wall slopes meeting the OSHA requirements, or the excavation side walls would require a ground support system for worker safety. Any ground support systems should be designed by an experienced registered geotechnical or structural engineer. The OSHA side slope requirements presume that effective dewatering will be provided.

APPENDIX

- General Report Qualifications
- Drilling Procedures
- Sampling Procedures
- Soil Sampling Methods

  ASTM D-1586 "Standard Method for Penetration Test and Split-Barrel Sampling of Soils"

- Laboratory Procedures
- Unified Soil Classification System (USCS)
- General Notes
- Soil Boring Location Diagram
- Soil Boring Logs

B-1	B-4
B-2	B-5
B-3	B-6

- Earthwork Recommendations
- GASAI Memorandum, "Southeast Wisconsin Faults"
- WDNR Borehole Abandonment Forms

This geotechnical engineering report was prepared as part of the evaluation of the specific area covered by the soil borings, specifically for the project described in the report. The description of the project represents our understanding of the project. Should there be any changes in the concept of the project, its location, orientation, or elevation, we request that we be notified so that we may assess any impacts of the changes on our recommendations. The drawings and specifications for the project shall be submitted to WKG^2 for review of conformance with the recommendations contained in the report. Failure to submit the plans and specifications for this review relieves WKG^2 from any liability for failure to comply with our recommendations.

The recommendations presented in this report have been based on subsurface information obtained from soil samples at intervals in the soil borings which were drilled at the locations shown on the soil boring location diagram. The number of borings and the sampling intervals used are considered to be consistent with standards of the industry.

It should be recognized that variations in subsurface conditions can occur both between soil samples in a given boring, and between soil borings. Further, groundwater conditions should be expected to vary with time. The extent of the variations in subsurface conditions may not become apparent until construction begins. If variations in subsurface conditions become apparent, we request that we be notified so that we can observe the site conditions and evaluate how our recommendations may be affected.

We strongly recommend that all construction work related to geotechnical issues be monitored by an experienced geotechnical engineer or technician to determine if the subsurface conditions are as anticipated, and if the intent of our recommendations is met. We are available to provide the monitoring and testing services required during construction on this project.

Due to possible variation in subsurface conditions, we recommend that the Standard General Conditions of the construction contract prepared by the Engineers Joint Contract Documents Committee (1910-8-(Latest Edition)) be included in the contract with the general contractor and any subcontractors who will be involved in geotechnical issues on this project. We also advise incorporating a dispute resolution clause in the contract, based on non-binding mediation, to resolve any disputes among the parties involved with geotechnical issues on the project.

The services provided by WKG^2 on this project were performed with the degree of skill and care typically performed by other members of our profession practicing in this locale at this time. No other warranty, expressed or implied, is given.

Hand-Auger Drilling (HA)

A sampling device is driven into the soil to the desired sample depth by a sledge hammer. After extracting the sample, the hole is advanced by a hand auger until the next sampling depth is reached. The manual driving of the sampler, especially into cohesive soils, may result in some sample disturbance. However, there are some situations where this method is the only viable option.

Solid-Stem Auger Drilling (AD)

Continuous flight augers are turned and hydraulically advanced by a truck- or track-mounted unit to create a borehole. In solid-stem auger drilling, casing and drilling mud are not typically used to maintain an open borehole.

Hollow-Stem Auger Drilling (HS)

Continuous flight augers having open stems are used to advance the borehole. The open stem allows the sampling tool to be used without removing the augers from the borehole. Hollow-stem augers maintain an open borehole during the sampling operations. This sampling method is not appropriate for geotechnical investigation beneath the water table, especially in granular soils.

Rotary Drilling (RD)

Various cutting bits, in conjunction with circulating drilling fluid, are used to advance the borehole. Surface casing is used to maintain sidewall stability in the top several meters of the borehole, and to facilitate the circulation of the drilling fluid into the mud tank.

Diamond Core Drilling (DD)

A double-tube or triple-tube core barrel with a diamond bit cuts an annular space around a cylinder of rock or cemented material. When the coring has proceeded to the desired core run length, the core is broken off and the sample is retained by a core catcher just above the diamond bit. Samples recovered by this procedure are placed in sturdy core boxes in sequential order.

Auger Sampling (AS)

Soil samples are obtained as cuttings from the auger flights as they are lifted from the borehole. Auger samples provide a general indication of subsurface conditions; however, they do not provide undisturbed samples, nor do they provide samples from specific depths. Due to the possible loss of soil components, or the mixing of soil components from various elevations, auger samples may not be representative of in-situ soil conditions.

Split-Barrel Sampling (SS) - ASTM Standard D-1586-84

A 2-inch-O.D. split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer free-falling 30 inches. The first 6 inches of penetration is usually considered a seating drive. The Standard Penetration Resistance value is the number of blows of the hammer over the final 12 inches of driving. This value provides an indication of the in-place relative density of granular soils. The indication should be considered qualitative, since many variables such as drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies can significantly affect the Standard Penetration Resistance value. A representative portion of the soil sample is recovered from the split-barrel sampler, placed in a sample jar, and delivered to our laboratory for further examination and possible testing.

Shelby Tube Sampling Procedure (ST) - ASTM Standard D-1587-83

A 2- or 3-inch-diameter thin-walled seamless steel tube having a sharp cutting edge is hydraulically pushed into the soil to obtain a relatively undisturbed sample. This procedure is generally used for cohesive soils. The Shelby tubes are carefully handled to minimize sample disturbance, and delivered to a laboratory where the soil is extruded from the tube, examined, and tested.

American Society for Testing and Materials

ASTM 1586
Standard Method for Penetration Test and Split-Barrel Sampling of Soils[1]

This standard is issued under the fixed designation D 1586; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of the last revision. A number in parentheses indicates the year of the last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This method has been approved for use by agencies of the Department of Defense and for listing in the DOD Index of Specifications and Standards.

1. Scope

1.1 This method describes the procedure, generally known as the Standard Penetration (SPT), for driving a split-barrel sampler to obtain a representative soil sample and a measure of the resistance of the soil to penetration of the sampler.

1.2 This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. For a specific precautionary statement, see 5.4.1.

1.3 The values stated in inch-pound units are to be regarded as the standard.

2. Applicable Documents

2.1 ASTM Standards:

D2487 Test Method for Classification of Soils for Engineering Purposes[2]

D2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)[2]

D4220 Practice for Preserving and Transporting Soil Samples[2]

3. Descriptions of Terms Specific to This Standard

3.1 anvil--that portion of the drive-weight assembly while the hammer strikes and through which the hammer energy passes into the drill rods.

3.2 cathead--the rotating drum or windlass in the rope-cathead lift system around which the operator wraps a rope to lift and drop the hammer by successively tightening and loosening the rope turns around the drum

3.3 drill rods--rods used to transmit downward force and torque to the drill bit while drilling a borehole.

3.4 drive-weight assembly--a device consisting of the hammer, hammer fall guide, the anvil, any hammer drop system.

3.5 hammer--that portion of the drive-weight assembly consisting of the 140 ± 2 lb (63.5 ± 1 kg) impact weight which is successfully lifted and dropped to provide the energy that accomplishes the sampling and penetration.

3.6 hammer drop system--that portion of the drive-weight assembly by which the operator accomplishes the lifting and dropping of the hammer to produce the blow.

3.7 hammer fall guide--that part of the drive-weight assembly used to guide the fall of the hammer.

3.8 N-value--the blowcount representation of the penetration resistance of the soil. The N-value, reported in blows per foot, equals the sum of the number of blows required to drive the sampler over the depth interval of 6 to 18 in. (150 to 450 mm) (see 7.3).

3.9 ΔN--the number of blows obtained from each of the 6-in. (150-mm) intervals os sampler penetration (see 7.3).

3.10 number of rope turns--the total contact angle between the rope and the cathead at the beginning of the operator's rope slackening to drop the hammer; divided by 360° (see Fig. 1).

3.11 sampling rods--rods that connect the drive-weight assembly to the sampler. Drill rods are often used for this purpose.

3.12 SPT--abbreviation for Standard Penetration Test, a term by which engineers commonly refer to this method.

4. Significance and Use

4.1 This method provides a soil sample for identification purposes and for laboratory tests appropriate for soil obtained from a sampler that may produce large shear strain disturbance in the sample.

4.2 This method is used extensively in a great variety of geotechnical exploration projects. Many local correlations and widely published correlations which relate SPT blowcount, or N-value, and the engineering behavior of earthworks and foundation are available.

5. Apparatus

5.1 Drilling Equipment--Any drilling equipment that provides at the time of sampling a suitably clean open hole before insertion of the sampler and ensures that the penetration test is performed on undistributed soil shall be acceptable. The following pieces of equipment have proven to be suitable for advancing a borehole in some subsurface conditions.

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[1]This method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of subcommittee D18.02 on Sampling and Related Field Testing for Soil Investigations.

Current edition approved Sept. 11, 1984. Published November 1984. Originally published as D1586-58T. Last previous edition D1586-67 (1974).

[2]Annual Book of ASTM Standards, Vol 04.08.

5.1.1 Drag, Chopping and Fishtail Bits, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used in conjunction with open-hole rotary drilling or casing-advancement drilling methods. To avoid disturbance of the underlying soil, bottom discharge bits are not permitted; only side discharging bits are permitted.

5.1.2 Roller-Cone Bits, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used in conjunction with open-hole rotary drilling or casing-advancement drilling methods if the drilling fluid discharge is deflected.

5.1.3 Hollow-Stem Continuous Flight Augers, with or without a center bit assembly, may be used to drill the boring. The inside diameter of the hollow-stem augers shall be less than 6.5 in. (162 mm) and greater that 2.2 in. (56 mm).

5.1.4 Solid, Continuous Flight, Bucket and Hand Augers, less than 6.5 in. (162 mm) and greater than 2.2 in. (56 mm) in diameter may be used if the soil on the side of the boring does not cave into the sampler or sampling rods during the sampling.

5.2 Sampling Rods--Flush-joint steel drill rods shall be used to connect the split-barrel sampler to the drive-weight assembly. The sampling rod shall have a stiffness (moment of inertia) equal to or greater than that of a parallel wall "A" rod (a steel rod which has an outside diameter of 1 5/8 in. (41.2 mm) and an inside diameter of 1 1/8 in. (28.5 mm).

NOTE 1--Recent research and comparative testing indicates the type rod used, with stiffness ranging from "A" size rod to "N" size rod, will usually have a negligible effect on the N-values to depths of at least 100 ft. (30 m).

5.3 Split-Barrel Sampler--The sampler shall be constructed with the dimensions indicated in Fig. 2. The driving shoe shall be hardened steel and shall be replaced or repaired when it becomes dented or distorted. The use of liners to produce a constant inside diameter of 1 3/8 in. (35 mm) is permitted, but shall be noted on the penetration record if used. The use of a sampler retainer basket is permitted, and should also be noted on the penetration record if used.

NOTE 2--Both theory and available test datas suggest that N-values may increase 10 to 30% when liners are used.

5.4 Drive-Weight Assembly

5.4.1 Hammer and Anvil--The hammer shall weigh 140 ± 2 lb (63.5 ± 1 kg) and shall be a solid rigid metallic mass. The hammer shall strike the anvil and make steel on steel contact when it is dropped. A hammer fall guide permitting a free fall shall be used. Hammers used with the cathead and rope method shall have an unimpeded overlift capacity of at least 4 in. (100 mm). For safety reasons, the use of hammer assembly with an internal anvil is encouraged.

NOTE 3--It is suggested that the hammer fall guide be permanently marked to enable the operator or inspector to judge the hammer drop height.

5.4.2 Hammer Drop System--Rope-cathead, trip, semi-automatic, or automatic hammer drop systems may be used, providing the lifting apparatus will not cause penetration of the sampler while re-engaging and lifting the hammer.

5.5 Accessory Equipment--Accessories such as labeled, sample containers, data sheets, and groundwater level measuring devices shall be provided in accordance with the requirements of the project and other ASTM standards.

6. Drilling Procedure

6.1 The boring shall be advanced incrementally to permit intermittent or continuous sampling. Test intervals and locations are normally stipulated by the project engineer or geologist. Typically, the intervals selected are 5 ft. (1.5 m) or less in homogeneous strata with test and sampling locations at every change of strata.

6.2 Any drilling procedure that provides a suitably clean and stable hole before insertion of the sampler and assures that the penetration test is performed on essentially undisturbed soil shall be acceptable. Each of the following procedures have proven to be acceptable for some subsurface conditions. The subsurface conditions anticipated should be considered when selecting the drilling method to be used.

6.2.1 Open-hole rotary drilling method.

6.2.2 Continuous flight hollow-stem auger method.

6.2.3 Wash boring method.

6.2.4 Continuous flight solid auger method.

6.3 Several drilling methods produce unacceptable borings. The process of jetting through an open tube sampler and then sampling when the desired depth is reached shall not be permitted. The continuous flight solid auger method shall not be used for advancing the boring below a water table or below the upper confining bed of a confined non-cohesive stratum that is under artesian pressure. Casing may not be advanced below the sampling elevation prior to sampling. Advancing a boring with bottom discharge bits is not permissible. It is not permissible to advance the boring for subsequent insertion of the sampler solely by means of previous sampling with the SPT sampler.

6.4 The drilling fluid within the boring or hollow-stem augers shall be maintained at or above the in situ groundwater level at all times during drilling, removal of drill rods, and sampling.

7. Sampling and Testing Procedure

7.1 After the boring has been advanced to the desired sampling elevation and excessive cuttings have been removed, prepare for the test with the following sequence of operations.

7.1.1 Attach the split-barrel sampler to the sampling rods and lower into borehole. Do not allow the sampler to drop onto the soil to be sampled.

7.1.2 Position the hammer above and attach the anvil to the top of the sampling rods. This may be done before the sampling rods and sampler are lowered into the borehole.

7.1.3 Rest the dead weight of the sampler, rods, anvil, and drive weight on the bottom of the boring and apply a seating blow. If excessive cuttings are encountered at the bottom of the boring, remove the sampler and sampling rods from the boring and remove the cuttings.

7.1.4 Mark the drill rods in three successive 6-in. (0.15-m) increments so that the advance of the sampler under the impact of the hammer can be easily observed for each 6-in. (0.15-m) increment.

7.2 Drive the sampler with blows from the 140-lb (63.5-kg) hammer and count the number of blows applied in each 6-in. (0.15-m) increment until one of the following occurs:

7.2.1 A total of 50 blows have been applied during any one of the three 6-in. (0.15-m) increments described in 7.1.4.

7.2.2 A total of 100 blows have been applied.

7.2.3 There is no observed advance of the sampler during the application of 10 successive blows of the hammer.

7.2.4 The sampler is advanced the complete 18 in. (0.45 m) without the limiting blow counts occurring as described in 7.2.1, 7.2.2, or 7.2.3.

7.3 Record the number of blows required to effect each 6 in. (0.15 m) of penetration or fraction thereof. The first 6 in. is considered to be a seating drive. The sum of the number of blows required for the second and third 6 in. of penetration is termed the "standard penetration resistance", or the "N-value". If the sampler is driven less than 18 in. (0.45 m), as permitted in 7.2.1, 7.2.2, or 7.2.3, the number of blows per each complete 6 in. (0.15-m) increment and per each partial increment shall be recorded on the boring log. For partial increments, the depth of penetration shall be reported to the nearest 1 in. (25 mm), in addition to the number of blows. If the sampler advances below the bottom of the boring under the static weight of the hammer, this information should be noted on the boring log.

7.4 The raising and dropping of the 140-lb (63.5-kg) hammer shall be accomplished using either the following two methods:

7.4.1 By using a trip, automatic, or semi-automatic hammer drop system which lifts the 140-lb (63.5 kg) hammer and allows it to drop 30 ± 1.0 in. (0.76 m ± 25 mm) unimpeded.

7.4.2 By using a cathead to pull a rope attached to the hammer. When the cathead and rope method is used the system and operation shall conform to the following:

7.4.2.1 The cathead shall be essentially free of rust, oil, or grease and have a diameter in the range of 6 to 10 in. (150 to 250 mm).

7.4.2.2 The cathead should be operated at a minimum speed of rotation of 100 RPM, or the approximate speed of rotation shall be reported on the boring log.

7.4.2.3 No more than 2 1/4 rope turns on the cathead may be used during the performance of the penetration test, as shown in Fig. 1.

NOTE 4–The operator should generally use either 1 3/4 of 2 1/4 rope turns, depending upon whether or not the rope comes off the top (1 3/4 turns) or the bottom (2 1/4 turns) of the cathead. It is generally known and accepted that 2 3/4 or more rope turns considerably impedes the fall of the hammer and should not be used to perform the test. The cathead rope should be maintained in a relatively dry, clean, and unfrayed condition.

7.4.2.4 For each hammer blow, a 30-in. (0.76 m) lift and drop shall be employed by the operator. The operation of pulling and throwing the rope shall be performed rhythmically without holding the rope at the top of the stroke.

7.5 Bring the sampler to the surface and open. Record the percent recovery or length of sample recovered. Describe the soil samples recovered as to composition, color, stratification, and condition, then place one or more representative portions of the sample into sealable moisture-proof containers (jars) without ramming or distorting any apparent stratification. Seal each container to prevent evaporation of soil moisture. Affix labels to the containers bearing job designation, boring number, sample depth, and the blow count per 6-in. (0.15 m) increment. Protect the samples against extreme temperature changes. If there is a soil change within the jar for each stratum and note its location in the sampler barrel.

8. Report

8.1 Drilling information shall be recorded in the filed and shall include the following:

8.1.1 Name and location of job,

8.1.2 Names of crew,

8.1.3 Type and make of drilling machine,

8.1.4 Weather conditions,

8.1.5 Date and time of start and finish of boring,

8.1.6 Boring number and location (station and coordinates, if available and applicable),

8.1.7 Surface evaluation, if applicable

8.1.8 Method of advancing and cleaning the boring,

8.1.9 Method of keeping boring open,

8.1.10 Depth of water surface and drilling depth at time of a noted loss of drilling fluid, and time and date when reading or notation was made,

8.1.11 Location of strata changes,

8.1.12 Size of casing, depth of cased portion of boring,

8.1.13 Equipment and method of driving sampler,

8.1.14 Type of sampler and length and inside diameter of barrel (note use of liners),

8.1.15 Size, type and section length of the sampling rods, and

8.1.16 Remarks.

8.2 Data obtained for each sample shall be recorded in the field and shall include the following:

8.2.1 Sample depth and, if utilized, the sample number,

8.2.2 Description of soil,

8.2.3 Strata changes within sample,

8.2.4 Sampler penetration and recovery lengths, and

8.2.5 Number of blows per 6-in. (0.15 m) or partial increment.

9. Precision and Bias

9.1 Variations in N-values of 100% or more have been observed when using different standard penetration test apparatus and drillers for adjacent borings in the same soil formation. Current opinion, based on field experience, indicates that when using the same apparatus and driller N-values in the same soil can be reproduced with coefficient or variation of about 10%.

9.2 The use of faulty equipment, such as extremely massive or damaged anvil, a rusty cathead, a low speed cathead, an old, oily rope, or massive or poorly lubricated rope sheaves can significantly contribute to differences in N-values obtained between operator-drill rig systems.

9.3 The variability in N-values produced by different drill rigs and operators may be reduced by measuring the part of the hammer energy delivered into the drilling rods from the sampler and adjusting N on the basis of comparative energies. A method for energy measurement and N-value adjustment is currently under development.

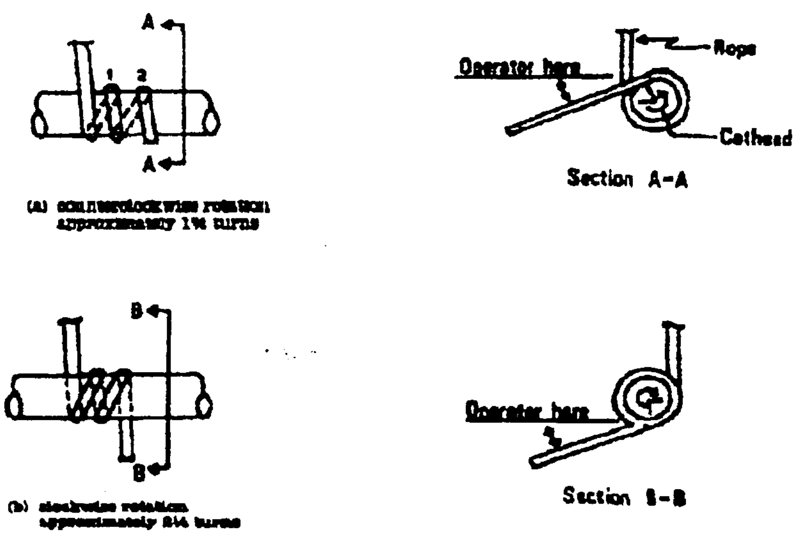
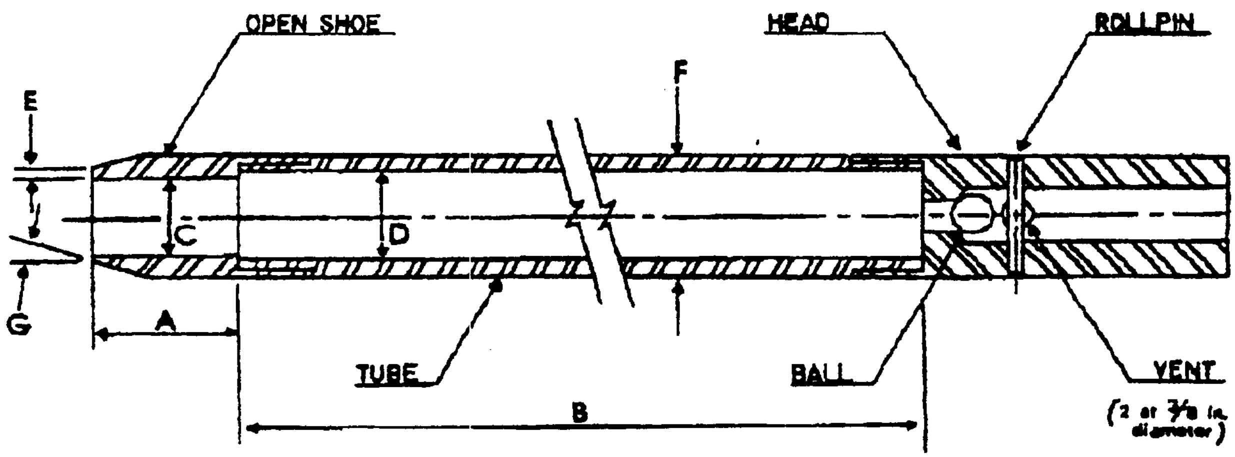


FIG. 1 Definitions of the number of rope turns and the angle for (a) counterclockwise rotation and (b) clockwise rotation of the cathead



A = 1.0 to 2.0 in. (25 to 50 mm)
B = 18.0 to 30.0 in. (0.457 to 0.762 m)
C = 1.375 ± 0.005 in. (34.93 ± 0.13 mm)
D = 1.50 ± 0.05 - 0.00 in. (38.1 ± 1.3 - 0.0 mm)
E = 0.10 ± 0.02 in. (2.54 ± 0.25 mm)
F = 2.00 ± 0.05 - 0.00 in. (50.8 ± 1.3 - 0.0 mm)
G = 16.0° to 23.0°

The 1 1/2 in. (38 mm) inside diamter split barrel may be used with a 16-gage wall thickness split liner. The penetrating end of the drive shoe may be slightly rounded. Metal or plastic retainers may be used to retain soil samples.

FIG. 2 Split-Barrel Sampler

Water Content (W_c)

The water content of a soil is determined by weighing a moist soil sample, drying it in an oven for approximately 24 hours, and reweighing the sample to determine the moisture loss. The water content is the ratio of the weight of water in the soil to the weight of the dry soil. Water content is typically expressed as a percentage.

Calibrated Hand Penetrometer (Q_p)

In the calibrated hand penetrometer test, the unconfined compressive strength of a soil is estimated to a maximum value of 4.5 tons per square foot (tsf) by measuring the resistance of the soil sample to penetration by a spring-calibrated plunger. The hand penetrometer test device has been carefully calibrated by its manufacturer with the results of numerous unconfined compressive strength tests. This test provides a quick, simple, and low-cost testing procedure from which soil strength can be estimated.

Unconfined Compression Test (Q_u)

In the unconfined compression strength test, an undisturbed cylinder of soil is loaded axially until the soil fails to carry additional load, or until 20% strain has been reached, whichever occurs first. The undrained shear strength of a cohesive soil is usually considered to equal half of the unconfined compressive strength.

Dry Density (γ_d)

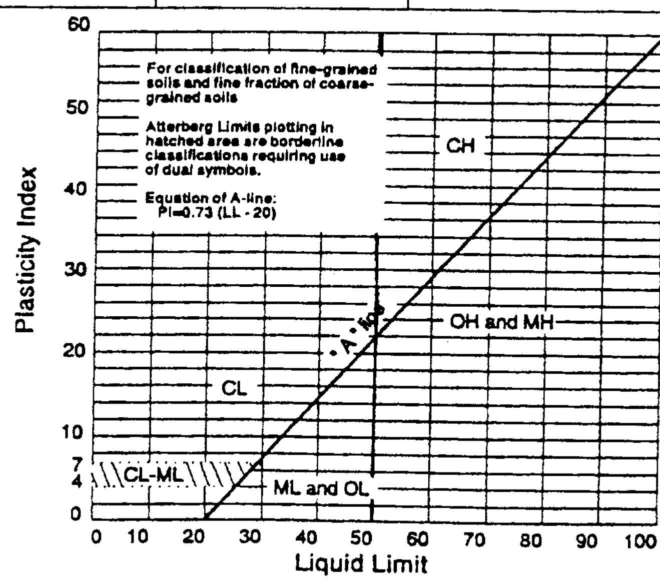
The dry density of a soil is the weight of dry soil in a unit volume. The soil's total unit weight is typically calculated by weighing a cylinder of soil, and dividing the weight by the cylinder's volume as calculated by measuring the cylinder's height and diameter at several locations. The soil's dry density is then determined by correcting the cylinder's weight to account for its water content measured as described above. Use of this value is often made when estimating the degree of compaction of a soil.

Classification of Samples

Soil samples are classified on the basis of their texture and plasticity in accordance with the Unified Soil Classification System (USCS). The two-letter designator in parentheses following each soil description on the boring logs represents the applicable unified classification. If the designator is capitalized, the classification has been confirmed by the appropriate index testing. If the designator is lower-case, the classification has been visually estimated.

Unified Soil Classification System (USCS)

Major Divisions			Group symbols		Typical names	Laboratory classification criteria		
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent ... GW, GP, SW, SP; More than 12 percent ... GM, GC, SM, SC; 5 to 12 percent ... Borderline cases requiring dual symbols	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM	d	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines		$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM	d	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half of material is smaller than No. 200 sieve size)	Silts and clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart (see below)		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL		Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soil, elastic silts			
			CH		Inorganic clays of high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		Pt		Peat and other highly organic soils			



Plasticity Chart

Drilling and Sampling Abbreviations:

AD	Solid-Stem Auger	OS	Osterberg Sampler, 3-inch-O.D. Shelby Tube
AS	Auger Sample	PM	Pressuremeter Test (In Situ)
BS	Bulk Sample	RD	Rotary Drilling
DD	Diamond Core Drilling	SS	Split-Spoon Sampler, 1.375-inch-I.D., 2-inch-O.D. (Unless otherwise noted)
FT	Fish Tail	ST	Shelby Tube Sampler, 2-inch-O.D. (Unless otherwise noted)
GP	Geoprobe	VS	Vane Shear
GS	Giddings Sampler	WOH	Weight of Hammer
HA	Hand-Auger Drilling	WS	Wash Sample
HS	Hollow-Stem Auger		

Standard Penetration ("N"): Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch-O.D. split-spoon sampler, except where otherwise noted.

Water Level Measurement Abbreviations:

AAR	After Auger Removal	BCR	Before Casing Removal	WS	While Sampling
AB	After Boring	DCI	Dry Cave In		
ACR	After Casing Removal	WCI	Wet Cave In		
BAR	Before Auger Removal	WD	While Drilling		
BCI	Before Casing Installation	WL	Water Level		

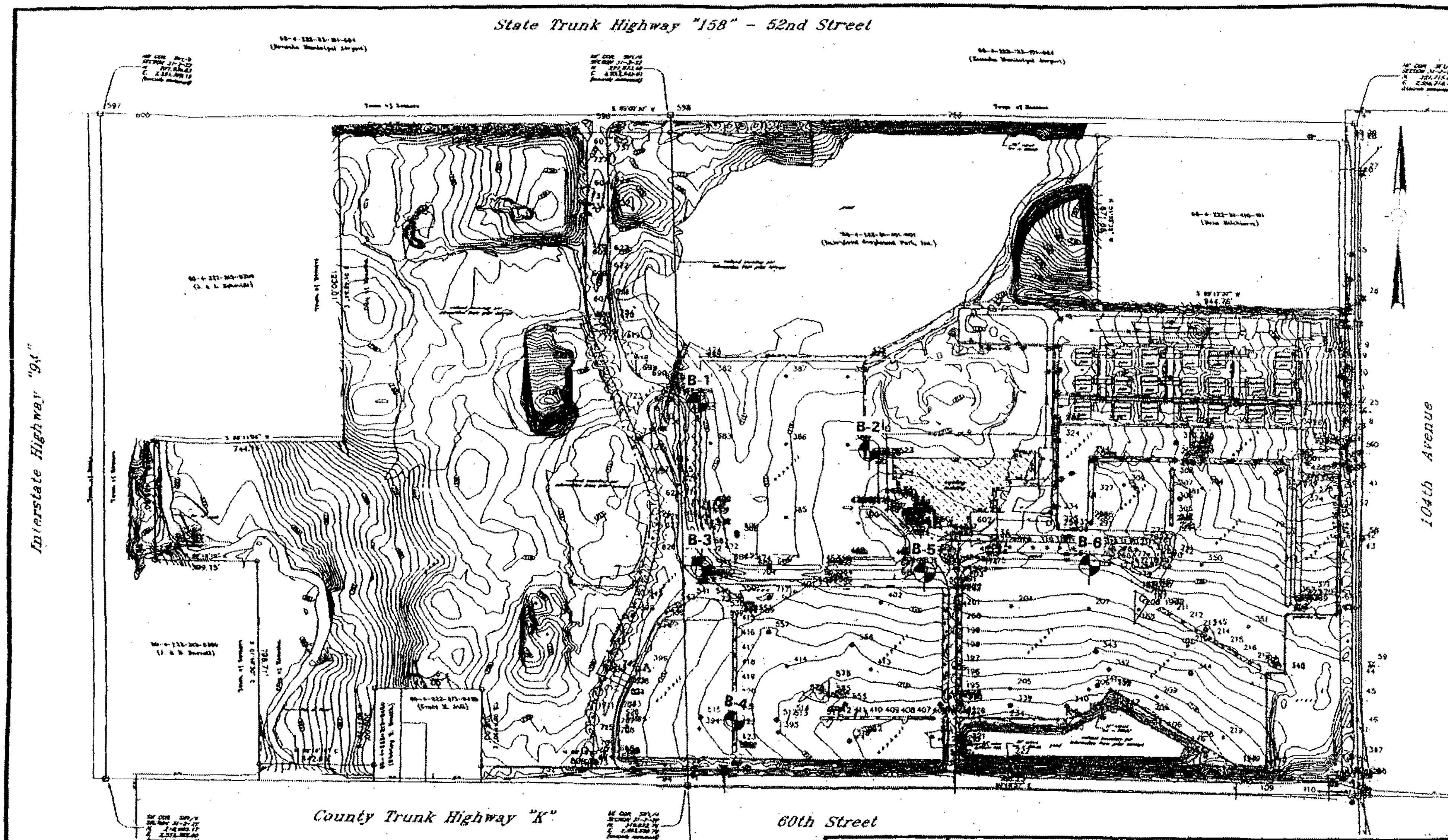
Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In relatively pervious soils, the observed water levels are considered a reliable indicator of groundwater positions. In relatively impervious soils, the accurate determination of groundwater elevations may not be possible, even after several days of observations. In this case, other indicators of groundwater position, such as sealed observation wells or piezometers, may be required.

Gradation Description and Terminology:

Coarse-grained granular soils have more than 50% of their dry weight retained on a #200 sieve (0.074 mm); they include boulders, cobbles, gravel, sand, and combinations thereof. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve. Fine-grained granular soils are non-cohesive, and include silt; fine-grained cohesive soils include silty clay, and clay.

Major Component of Sample	Size Range	Description of Components Present in Sample	Percent of Dry Weight
Boulders	Over 8" (200 mm)	Trace	1 - 9
Cobbles	8" to 3" (200 to 75 mm)	Little	10 - 19
Gravel	3" to #4 sieve (75 to 4.76 mm)	Some	20 - 34
Sand	#4 to #200 sieve (4.76 to 0.074 mm)	And	35 - 50
Silt	Passing #200 sieve (0.074 to 0.005 mm)		
Clay	Smaller than 0.005 mm		

Consistency of Cohesive Soils		Relative Density of Granular Soils	
Unconfined Compressive Strength, Qu, tsf	**Consistency**	**N, Blows per 12 inches**	**Relative Density**
<0.25	Very Soft	0 - 3	Very Loose
0.25 - 0.49	Soft	4 - 9	Loose
0.50 - 0.99	Medium (Firm)	10 - 29	Medium Dense
1.00 - 1.99	Stiff	30 - 49	Dense
2.00 - 3.99	Very Stiff	50 - 80	Very Dense
>4.00	Hard	>80	Extremely Dense



WKG Wagner Komurka Geotechnical Group, Inc.	SOIL BORING LOCATION DIAGRAM						
	MENOMONEE CASINO-HOTEL					PROJECT NO.	04017
	DATE	06-02-04	DRAWN BY	RKM	CHECKED BY CJW	SCALE	NTS

Wagner Komurka Geotechnical Group, Inc.

PROJECT NAME	SITE LOCATION	BORING NO.
Menomonee Casino-Hotel	Kenosha, Wisconsin	B-1
OWNER	**ARCHITECT/ENGINEER:**	**SHEET** 1 **OF** 1
Kenesah Gaming Development, LLC.	Graef, Anhalt, Schloemer & Associates, Inc.	

SOIL/ROCK DESCRIPTION

STATION: OFFSET:
NORTHING: EASTING:
SURFACE ELEVATION: +716.0 feet (Project Datum)

ELEVATION/ DEPTH, FEET	SAMPLE NUMBER	TYPE	SOIL/ROCK DESCRIPTION	Elev.	Depth
716 / 0			TOPSOIL: Topsoil, 12 inches thick (Driller's observation)	715.0	1.0
	1	SS	Silty clay, trace to little sand, with sand seams - grayish brown transitioning to yellow-brown with depth - very stiff (cl)		
	2	SS		710.7	5.3
	3	SS	Silty clay, trace sand, with clayey silt seams - brown to 12 feet, grayish brown deeper - very stiff to hard (cl)		
	4	SS			
	5A	SS		701.5	14.5
	5B	SS	Silty fine to medium sand, trace coarse sand and gravel - grayish brown - wet - medium dense (sm)	701.0	15.0
	6	SS	Silty clay, little sand, trace gravel - gray - stiff to very stiff (cl)		
	7	SS		691.0	25.0

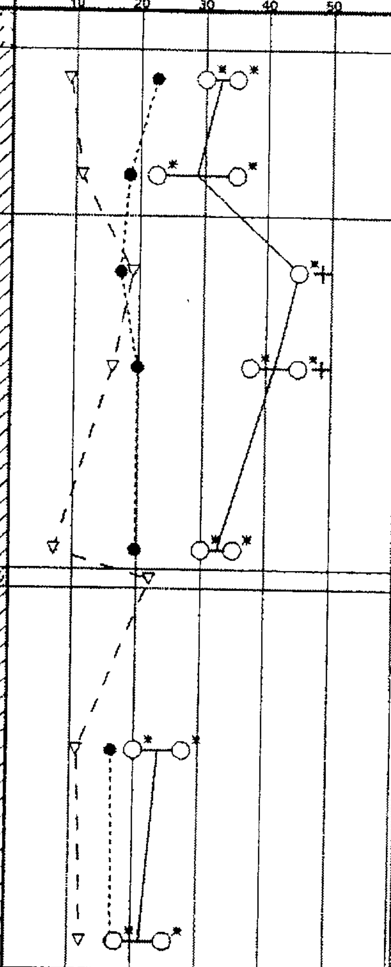
Elevation scale: 715, 710, 705, 700, 695, 690, 685, 680. Depth scale: 0, 5, 10, 15, 20, 25, 30, 35, 40.

End of Boring.

Boring advanced to 23.5 feet using 2.25-inch-I.D. hollow-stem auger with center plug.

Boring backfilled with medium bentonite chips upon completion.

○ UNCONFINED COMPRESSIVE STRENGTH, TONS/FT² (* BY CALIBRATED PENETROMETER) 1 2 3 4 5
PLASTIC LIMIT, % ■ WATER CONTENT, % ● LIQUID LIMIT, % ▲
▽ STANDARD PENETRATION TEST, BLOWS/FT. 10 20 30 40 50



THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES; IN-SITU, THE TRANSITIONS MAY BE GRADUAL.

DRILLING COMPANY	RIG/HAMMER	FOREMAN	BORING STARTED	BORING COMPLETED
Badger State Drilling Company, Inc.	CME 55/Auto	James Riech	05-11-04	05-11-04
WATER LEVEL(S)		**INSPECTOR(S)**	**APPROVED BY**	**PROJECT NO.**
14.5 feet While Drilling; 19.9 feet 1 Day After Boring			CJW	04017

WKG² Wagner Komurka Geotechnical Group, Inc.	PROJECT NAME: Menomonee Casino-Hotel	SITE LOCATION: Kenosha, Wisconsin	BORING NO. B-2
	OWNER: Kenesah Gaming Development, LLC.	ARCHITECT/ENGINEER: Graef, Anhalt, Schloemer & Associates, Inc.	SHEET 1 OF 1

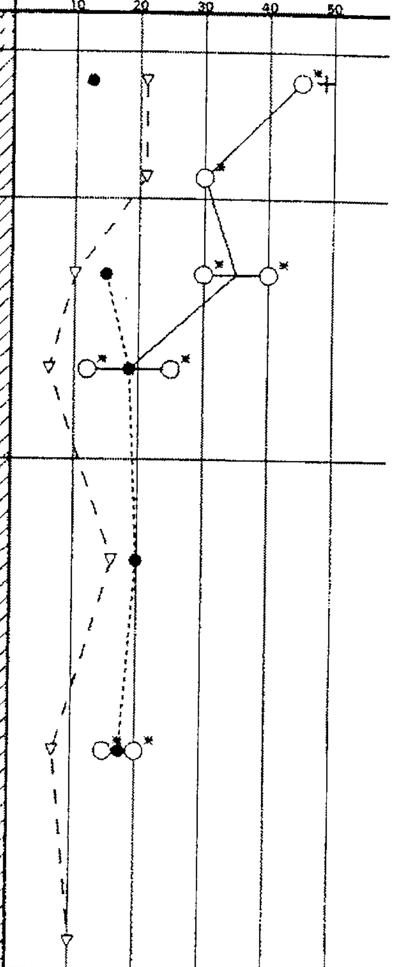
SOIL/ROCK DESCRIPTION

STATION: OFFSET:
NORTHING: EASTING:

SURFACE ELEVATION: +715.5 feet (Project Datum)

ELEVATION/DEPTH, FEET	SAMPLE NUMBER	TYPE	SOIL/ROCK DESCRIPTION	Elev. / Depth
715 / 0			TOPSOIL: Topsoil, 12 inches thick (Driller's observation)	714.5 / 1.0
	1	SS	POSSIBLE FILL: Silty clay, little sand, trace to little gravel, with topsoil inclusions, and sandy silt seam/pockets - yellow-brown - moist - very stiff to hard (POSSIBLE FILL: cl)	
	2	SS	Note: Sample 2 drove a stone - Driller's observation	710.7 / 4.8
710 / 5			Silty clay, little sand, trace gravel - brown transitioning to grayish brown - stiff to hard (cl)	
	3	SS		
	4	SS		
705 / 10				703.9 / 11.6
			Silty clay, trace sand, trace gravel - grayish brown to 17 feet, gray below - stiff to very stiff (cl)	
	5	SS		
700 / 15				
	6	SS		
695 / 20				
	7	SS	Note: Sample 7 recovery disturbed - no calibrated penetrometer reading possible.	690.5 / 25.0
690 / 25			End of Boring.	
			Boring advanced to 23.5 feet using 2.25-inch-I.D. hollow-stem auger with center plug.	
			Boring backfilled with medium bentonite chips, upon completion.	
685 / 30				
680 / 35				
40				

○ UNCONFINED COMPRESSIVE STRENGTH, TONS/FT² (* BY CALIBRATED PENETROMETER) 1 2 3 4 5
PLASTIC LIMIT, % ■ WATER CONTENT, % ● LIQUID LIMIT, % ▲
▽ STANDARD PENETRATION TEST, BLOWS/FT. 10 20 30 40 50



THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES; IN-SITU, THE TRANSITIONS MAY BE GRADUAL.

DRILLING COMPANY	RIG/HAMMER	FOREMAN	BORING STARTED	BORING COMPLETED
Badger State Drilling Company, Inc.	CME 55/Auto	James Riech	05-11-04	05-11-04

WATER LEVEL(S)	INSPECTOR(S)	APPROVED BY	PROJECT NO.
20.2 feet WCI 15 minutes and 1 day After Boring		CJW	04017

WKG² Wagner Komurka Geotechnical Group, Inc.

PROJECT NAME	SITE LOCATION	BORING NO.
Menomonee Casino-Hotel	Kenosha, Wisconsin	B-3
OWNER	**ARCHITECT/ENGINEER**	**SHEET** 1 OF 1
Kenesah Gaming Development, LLC.	Graef, Anhalt, Schloemer & Associates, Inc.	

SOIL/ROCK DESCRIPTION

STATION: OFFSET:
NORTHING: EASTING:
SURFACE ELEVATION: + 715.0 feet (Project Datum)

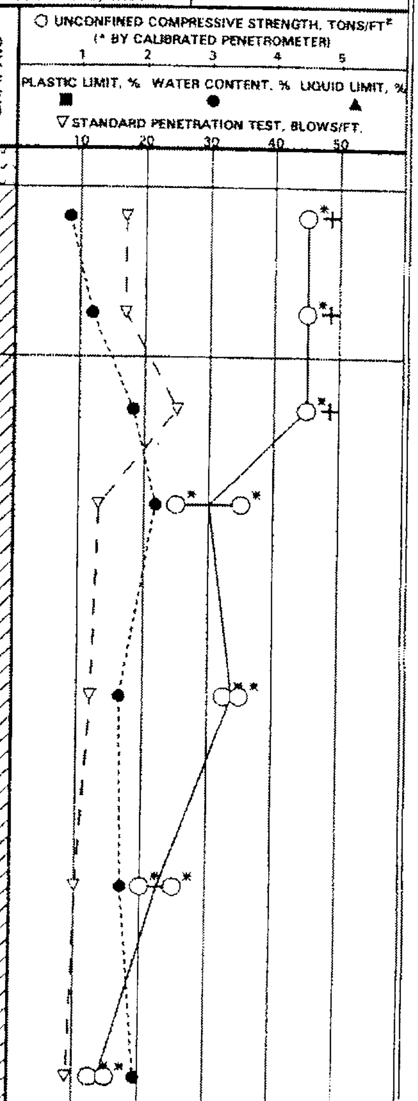
ELEVATION/DEPTH, FEET	SAMPLE NUMBER	TYPE	DESCRIPTION	Bottom Elev. / Depth
715 / 0			TOPSOIL: Topsoil, 12 inches thick (Driller's observation)	714.0 / 1.0
	1	SS	Silty clay, little sand, trace to little gravel, with silt,sandy silt,clayey silt seams and layers - yellow-brown transitioning to brown with depth - hard (cl)	
710 / 5	2	SS		709.6 / 5.4
	3	SS	Silty clay, trace to little sand, trace gravel - brown to 8 feet, gray below - stiff to hard (cl)	
705 / 10	4	SS		
700 / 15	5	SS		
695 / 20	6	SS		
690 / 25	7	SS		690.0 / 25.0

End of Boring.

Boring advanced to 23.5 feet using 2.25-inch-I.D. hollow-stem auger with center plug.

Boring backfilled with medium bentonite chips, upon completion.

Depth scale: 715/0, 710/5, 705/10, 700/15, 695/20, 690/25, 685/30, 680/35, 675/40



THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES; IN-SITU, THE TRANSITIONS MAY BE GRADUAL.

DRILLING COMPANY	RIG/HAMMER	FOREMAN	BORING STARTED	BORING COMPLETED
Badger State Drilling Company, Inc.	CME 55/Auto	James Riech	05-12-04	05-12-04
WATER LEVEL(S)		**INSPECTOR(S)**	**APPROVED BY**	**PROJECT NO.**
Dry While Drilling; DCI at 20.7 feet 15 minutes After Boring			CJW	04017

WKG² Wagner Komurka Geotechnical Group, Inc.	PROJECT NAME: Menom[illegible] Casino-Hotel	SITE LOCATION: Kenosha, Wisconsin	BORING NO. B-4
	OWNER: Kenesah Gaming Development, LLC.	ARCHITECT/ENGINEER: Graef, Anhalt, Schloemer & Associates, Inc.	SHEET 1 OF 1

STATION: OFFSET:
NORTHING: EASTING:

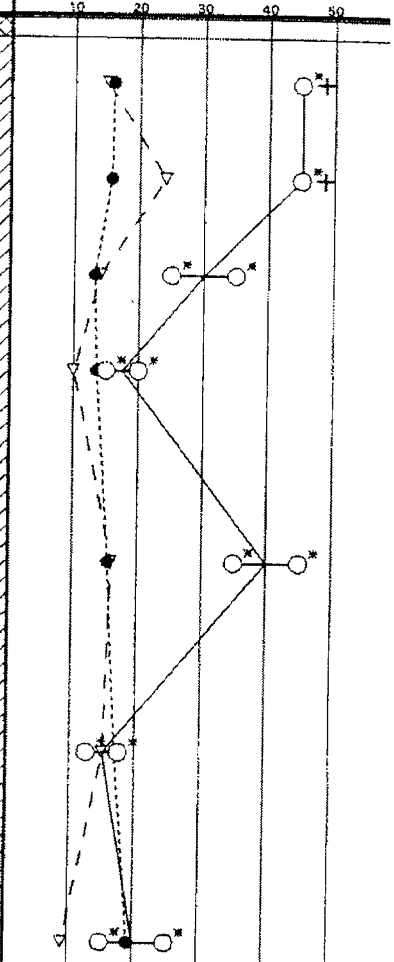
SURFACE ELEVATION: + 711.0 feet (Project Datum)

ELEVATION/DEPTH, FEET	SAMPLE NUMBER	SAMPLE TYPE	SOIL/ROCK DESCRIPTION
710.9 / 0.1			PAVEMENT: Asphaltic concrete, 1 inch thick (Driller's observation)
710.4 / 0.6	1	SS	BASECOURSE: Sand and gravel, 6 inches thick (Driller's observation)
	2	SS	Silty clay, trace to little sand, trace gravel - brown to 5.5 feet, gray deeper - stiff to hard (cl)
	3	SS	
	4	SS	
	5	SS	
	6	SS	
686.0 / 25.0	7	SS	

End of Boring.

Boring advanced to 23.5 feet using 2.25-inch-I.D. hollow-stem auger with center plug.

Boring backfilled with medium bentonite chips, and pavement patched, upon completion.



THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES; IN-SITU, THE TRANSITIONS MAY BE GRADUAL.

DRILLING COMPANY	RIG/HAMMER	FOREMAN	BORING STARTED	BORING COMPLETED
Badger State Drilling Company, Inc.	CME 55/Auto	James Riech	05-11-04	05-11-04

WATER LEVEL(S)	INSPECTOR(S)	APPROVED BY	PROJECT NO.
Dry While Drilling; 1.7 feet 1 Day After Boring		CJW	04017

WKG² Wagner Komurka Geotechnical Group, Inc.	PROJECT NAME Menomonee Casino-Hotel	SITE LOCATION Kenosha, Wisconsin	BORING NO. B-5
	OWNER Kenesah Gaming Development, LLC.	ARCHITECT/ENGINEER Graef, Anhalt, Schloemer & Associates, Inc.	SHEET 1 OF 1

SOIL/ROCK DESCRIPTION

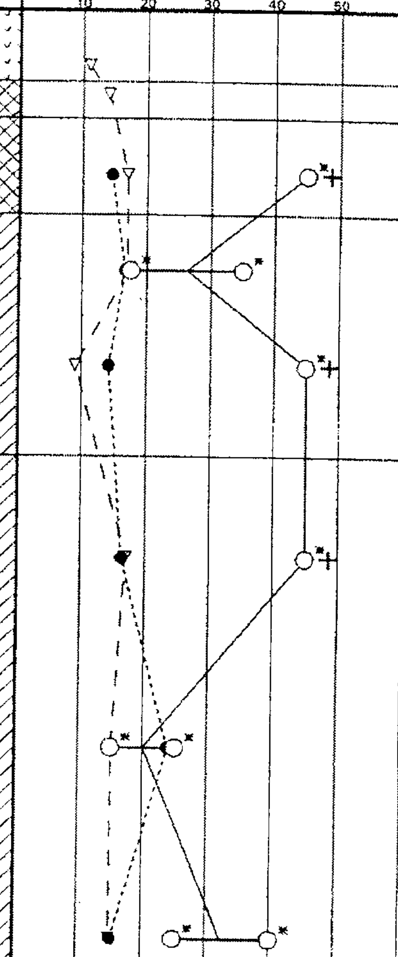
STATION: OFFSET:
NORTHING: EASTING:
SURFACE ELEVATION: + 717.0 feet (Project Datum)

ELEVATION/ DEPTH, FEET	SAMPLE NUMBER	TYPE	SOIL/ROCK DESCRIPTION	Elev. / Depth
717 / 0 – 715.2 / 1.8	1A	SS	TOPSOIL: Topsoil, 22 inches thick (Driller's observation)	715.2 / 1.8
715.2 / 1.8 – 714.2 / 2.8	1B	SS	FILL: Fine to coarse sand, trace gravel, trace silt - brown - moist - medium dense (FILL: sp-sm)	714.2 / 2.8
714.2 / 2.8 – 711.7 / 5.3	2	SS	FILL: Silty clay, little sand, trace to little gravel with topsoil inclusions - brown with yellow-brown seams/layers - hard (FILL: cl)	711.7 / 5.3
711.7 / 5.3 – 705.4 / 11.6	3 4	SS SS	Silty clay, little sand, trace to little gravel - brown with brown-gray seams - stiff to hard (cl)	705.4 / 11.6
705.4 / 11.6 – 692.0 / 25.0	5 6 7	SS SS SS	Silty clay, trace to little sand, trace gravel - grayish brown to 17 feet, gray below - stiff to hard (cl)	692.0 / 25.0

End of Boring.

Boring advanced to 23.5 feet using 2.25-inch-I.D. hollow-stem auger with center plug.

Boring backfilled with medium bentonite chips upon completion.



THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES; IN-SITU, THE TRANSITIONS MAY BE GRADUAL.

DRILLING COMPANY	RIG/HAMMER	FOREMAN	BORING STARTED	BORING COMPLETED
Badger State Drilling Company, Inc.	CME 55/Auto	James Riech	05-11-04	05-11-04
WATER LEVEL(S)		INSPECTOR(S)	APPROVED BY	PROJECT NO.
Dry While Drilling; DCI at 21 feet 1 Day After Boring			CJW	04017

WKG² Wagner Komurka Geotechnical Group, Inc.

PROJECT NAME	SITE LOCATION	BORING NO.
Menomonee Casino-Hotel	Kenosha, Wisconsin	B-6
OWNER	**ARCHITECT/ENGINEER**	**SHEET** 1 **OF** 1
Kenesah Gaming Development, LLC.	Graef, Anhalt, Schloemer & Associates, Inc.	

SOIL/ROCK DESCRIPTION

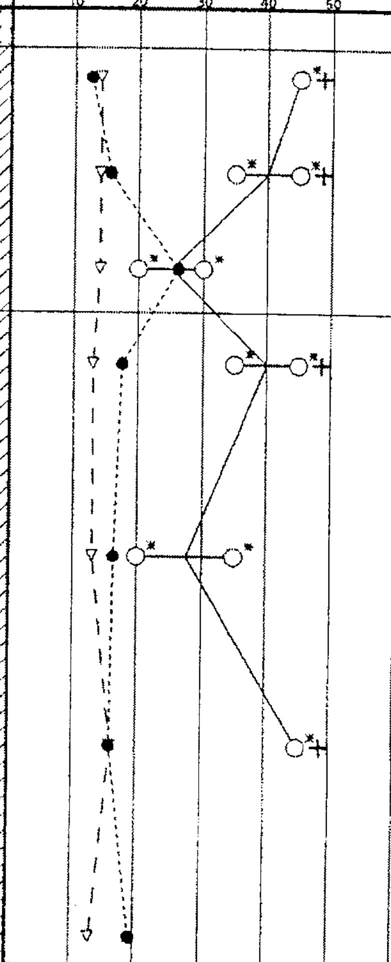
STATION: OFFSET:
NORTHING: EASTING:
SURFACE ELEVATION: + 718.0 feet (Project Datum)

ELEVATION/DEPTH, FEET	SAMPLE NUMBER	TYPE	SOIL/ROCK DESCRIPTION
717.0 / 1.0			TOPSOIL: Topsoil, 12 inches thick (Driller's observation)
710.1 / 7.9	1	SS	Silty clay, little sand, trace to little gravel - brown to 5.5 feet, gray below - very stiff to hard (cl)
	2	SS	
	3	SS	
693.0 / 25.0	4	SS	Silty clay, trace to little sand, trace gravel - gray - very stiff to hard (cl)
	5	SS	
	6	SS	
	7	SS	Note: Sample 7 recovery ribboned - no calibrated penetrometer reading possible.

End of Boring.

Boring advanced to 23.5 feet using 2.25-inch-I.D. hollow-stem auger with center plug.

Boring backfilled with medium bentonite chips upon completion.



THE STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES; IN-SITU, THE TRANSITIONS MAY BE GRADUAL.

DRILLING COMPANY	RIG/HAMMER	FOREMAN	BORING STARTED	BORING COMPLETED
Badger State Drilling Company, Inc.	CME 55/Auto	James Riech	05-11-04	05-11-04
WATER LEVEL(S)		**INSPECTOR(S)**	**APPROVED BY**	**PROJECT NO.**
Dry While Drilling; 11.8 feet 1 Day After Boring			CJW	04017

Fill or backfill required on this project should consist of inorganic soil which contains no debris, stones larger than 4 inches in diameter, nor frozen matter.

The natural water content of the soil should be within three percent of the optimum water content as determined by a Proctor test. If the moisture content of the fill is outside this range, it may be difficult to obtain the specified degree of compaction.

Uniform fill or backfill should be used on the project. If non-uniform soils are used, or two or more soil types are mixed, the field personnel will have to exercise judgment regarding which Proctor density standard applies. This will reduce the degree of certainty in the test results.

The fill or backfill should be placed in loose horizontal lifts, no thicker than nine inches, and compacted with a compactor appropriate for the soil type. Typically, vibratory drum or vibratory plate compactors are appropriate for granular soils, while a sheepsfoot, segmented foot, jumping jack, or other compactor which kneads the soil, is appropriate for cohesive soils.

Fill or backfill placed to support heavily loaded (>500 psf) floor slabs, foundations, and pavements subject to concentrated automobile traffic or occasional truck traffic, should be compacted to a minimum of 95% of the modified Proctor test (ASTM D-1557) density. Fill or backfill placed to support lightly loaded (<500 psf) floor slabs, or pavements subject only to light automobile traffic, should be compacted to a minimum of 90% of the modified Proctor test density.

In some instances, a relatively thin stratum of weak or unsuitable soil may exist beneath a proposed foundation. It is a common practice to remove a volume of the weak soil for the full thickness of the stratum, and replace it with compacted fill to support the foundation. The weak soil commonly remains in place laterally beyond each excavated and backfilled zone. In this situation, the compacted backfill should extend laterally beyond each edge of the foundation a minimum of one-half foot for each one foot of compacted fill thickness beneath the foundation.

Fill is difficult to compact at the edge of slopes. If achieving compaction in this area is critical, it may be necessary to place and compact the fill a few feet beyond the desired slope face, and subsequently trim the slope back to the desired angle. For long-term maintenance concerns, slopes should typically be no steeper than 2 or 2-1/2 horizontal to 1 vertical.

State of Wisconsin
Department of Natural Resources

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

Form 3300-5P 2/2000 Page 1 of 2

Notice: Please complete Form 3300-5P and return it to the appropiate DNR office and bureau. Completion of this report is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file this form may result in a forteiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See the instructions for more information.

Route to: ☐ Drinking Water ☐ Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☐ Other

(1) GENERAL INFORMATION

WI Unique Well No. — DNR Well ID No. — County: KENOSHA

Common Well Name ____ Gov't Lot (If applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ N; R. ____ ☐ E ☐ W

Grid Location

____ ft. ☐ N. ☐ S., ____ ft. ☐ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☐

Lat. ____ Long ____ or

St. Plane ____ ft. N. ____ ft. E. ☐ S ☐ C ☐ N Zone

Reason For Abandonment

WI Unique Well No. of Replacement Well

(2) FACILITY / OWNER INFORMATION

Facility Name: DAIRY LAND PARK

Facility ID

License/Permit/Monitoring No.

Street Address of Well: I94 & STATE HWY 158

City, Village, or Town: KENOSHA, WI

Present Well Owner

Original Owner

Street Address or Route of Owner

City, State, Zip Code

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date 5-11-04

☐ Monitoring Well
☐ Water Well
☒ Borehole / Drillhole

If a Well Construction Report is available, please attach.

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify)

Formation Type:
☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft.) (From groundsurface) ____ Casing Diameter (in.) ____

Casing Depth (ft.) ____

Lower Drillhole Diameter (in.) ____

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? ____ Feet

Depth to Water (Feet) ____

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed? ☐ Yes ☐ No ☒ Not Applicable
Liner(s) Removed? ☐ Yes ☐ No ☒ Not Applicable
Screen Removed? ☐ Yes ☐ No ☒ Not Applicable
Casing Left in Place? ☐ Yes ☒ No

Was Casing Cut Off Below Surface? ☐ Yes ☒ No
Did Sealing Material Rise to Surface? ☒ Yes ☐ No
Did Material Settle After 24 Hours? ☐ Yes ☒ No
If Yes, Was Hole Retopped? ☐ Yes ☒ No

Required Method of Placing Sealing Material
☒ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry (11 lb./gal. wt.)
☐ Bentonite-Sand Slurry " "
☒ Bentonite Chips

For monitoring wells and monitoring well boreholes only
☐ Bentonite Chips
☐ Granular Bentonite
☐ Bentonite - Cement Grout
☐ Bentonite - Sand Slurry

(5) Material Used To Fill Well/Drillhole	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	(Circle One)	Mix Ratio or Mud Weight
1,2,4,5,6,8 7/8 HOLE PLUGS	Surface		5		TOTAL 30

(6) Comments:

(7) Name of Person or Firm Doing Sealing Work: Badger State Drilling Co., Inc.

Date of Abandonment: 5-11-04

Signature of Person Doing Work: [signature]

Date Signed: 5/12/04

Street or Route: 360 Business Park Cr.

Telephone Number: (608) 877-9770

City, State, Zip Code: Stoughton, WI 53589

FOR DNR OR COUNTY USE ONLY	
Date Received	Noted By
Comments	

DNR/COUNTY